

WHAT IS CLAIMED IS:

1. An injection molding apparatus comprising:
 - a mold body having a cavity for forming a hollow molded plastic part;
 - a runner for supplying fluent plastic to said cavity;
 - a least one fluid injection pin mounted to said mold body and connectable to a fluid source;
 - a reservoir positioned remote from said cavity and selectively connectable to said runner; and
 - a valve positioned adjacent a mouth of said runner, said valve being operable between a first state at which said reservoir is fluidly connected to said runner, and a second state at which said reservoir is blocked from fluid communication with said runner.
2. The injection molding apparatus of claim 1 wherein said mold cavity has an upstream end and a downstream end;
 - said runner is fluidly connected to said mold cavity at a gate positioned adjacent said upstream end; and
 - said at least fluid injection pin is positioned proximate said downstream end.
3. The injection molding apparatus of claim 2 wherein said gate directs fluent plastic into said mold cavity in a substantially downstream direction during a plastic injection cycle, and said at least one fluid injection pin directs fluid into said mold cavity in substantially upstream direction during a plastic ejection cycle.

4. The injection molding apparatus of claim 1 further comprising actuating means for operating said valve member between said first and said second states.

5. The injection molding apparatus of claim 4 wherein said valve is hydraulically actuated.

6. The injection molding apparatus of claim 4 wherein said valve is pneumatically actuated.

7. The injection molding apparatus of claim 4 wherein said valve is electromechanically actuated.

8. The injection molding apparatus of claim 1 wherein a volume of said runner is greater than or equal to a volume of plastic ejected from said cavity by fluid injected through said at least one fluid injection pin.

9. The injection molding apparatus of claim 1 wherein said mold cavity has an upstream end and a downstream end;

said runner is fluidly connected to said mold cavity at a gate positioned adjacent said upstream end; and

said at least one fluid injection pin is positioned proximate said downstream end.

10. The injection molding apparatus of claim 4 wherein said valve is electromechanically actuated.

11. The injection molding apparatus of claim 1 wherein said reservoir has a selectively variable volume.

12. A process for injection molding of fluid filled plastic bodies in an apparatus having a mold cavity and a fluid reservoir, the process comprising the steps of:

injecting a quantity of flowable plastic into an interior of the mold cavity through a supply passage;

cooling part of the plastic melt along walls of the mold cavity, thereby providing an interior of flowable, plastic melt;

injecting fluid from the fluid source into the interior of flowable, plastic melt;

selectively expelling at least a portion of the interior of flowable, plastic melt into the supply passage; and

selectively expelling at least a portion of fluent plastic from the supply passage into the reservoir.

13. A process for injection molding of plastic bodies in a molding apparatus having a mold cavity, the process comprising the steps of:

injecting flowable plastic into the mold cavity;

injecting pressurized compressible fluid into the interior of said flowable plastic in said cavity, increasing the pressure within said cavity then to a predetermined pressure; then

selectively connecting the mold cavity with a reservoir after a portion of said flowable plastic flows from the mold cavity.

14. The process of claim 13 wherein said step of selectively connecting is characterized by actuating a control valve to fluidly connect the mold cavity with the reservoir.

15. The process of claim 13 wherein said portion of the interior of flowable plastic flows from the mold cavity in the direction of said injection of flowable plastic.

16. The process of claim 13 wherein said portion of the interior of flowable plastic flows from the mold cavity in an upstream direction opposite the direction of said injection of flowable plastic.

17. A process for injection molding of hollow articles in an apparatus having a mold cavity and a reservoir, the process comprising the steps of:

injecting fluent plastic into the apparatus;

injecting a pressurized compressible fluid into the fluent plastic, the fluid forming a pocket of pressurized fluid therein;

substantially maintaining fluid a predetermined pressure in the mold for a predetermined duration; and

selectively connecting the mold cavity to the reservoir, so that a portion of the fluent plastic flows to the reservoir.

18. The process of claim 17 wherein the predetermined duration is about two seconds to about ten seconds.

19. The process of claim 17 wherein the step of selectively connecting the mold cavity to the reservoir includes actuating a control valve to fluidly connect the mold cavity therewith.

20. The process of claim 17 wherein the portion of fluent plastic flows to the reservoir in a downstream direction.

21. The process of claim 17 wherein said portion of the fluent plastic flows from the mold cavity in the direction of said injection of fluent plastic.

22. The process of claim 17 wherein said portion of the fluent plastic flows from the mold cavity in a direction opposite to the direction of said injection of fluent plastic.

23. A method for injection molding a part having at least one cavity therein, comprising the steps of;

injecting thermoplastic melt into a cavity of an injection molding tool to partially fill the cavity;

injecting a core fluid into the thermoplastic melt; and

injecting a control fluid into a reservoir in fluid communication with said cavity.

24. The method of claim 23 wherein at least a portion of said thermoplastic melt is expelled from said cavity into said reservoir.

25. The method of claim 24 wherein said control fluid opposes the flow of said thermoplastic melt into said reservoir.

26. The method of claim 25 wherein the injection of said control fluid is selected to control the rate of flow of said thermoplastic melt.

27. The method of claim 23 wherein one of said fluids is water.

28. A method for injection molding a part having at least one cavity therein, comprising the steps of;

injecting thermoplastic melt into a cavity of an injection molding tool to partially fill the cavity;

injecting a core fluid into the thermoplastic melt; and

injecting a control fluid into said cavity downstream of said thermoplastic melt.

29. The method of claim 28 wherein at least a portion of said thermoplastic melt is expelled from said cavity into a reservoir.

30. The method of claim 28 wherein said control fluid opposes the flow of said thermoplastic melt into said reservoir.

31. The method of claim 28 wherein the injection of said control fluid is selected to control the rate of flow of said thermoplastic melt.

32. The method of claim 28 wherein one of said fluids is water.

33. An injection molding apparatus comprising:
a mold body having a cavity for forming a hollow molded plastic part;
an inlet for injection of fluent plastic into said cavity;
two fluid injection pins mounted to said mold body at spaced apart locations in said mold cavity along the flow path of said fluent plastic, each of said pins connected to a discrete fluid source.

34. An injection molding apparatus comprising:
a mold body having a cavity for forming a hollow molded plastic part;
an inlet for the injection of fluent plastic fluidly into said cavity;
a first fluid injection pin in direct fluid communication with said cavity;
a reservoir in fluid communication with said cavity; and
a second fluid injection pin in direct fluid communication with said reservoir.

35. The apparatus of claim 34 wherein said first fluid injection pin located at between said inlet and said reservoir.

36. The apparatus of claim 34 further comprising a runner for delivering said fluent plastic to said inlet, at least a portion of said runner defining a flow path between said reservoir and said cavity.

37. The apparatus of claim 34 further comprising at least two distinct fluid sources.

38. The apparatus of claim 34 wherein said fluid injection pins are connected to distinct fluid sources.

39. The apparatus of claim 34 further comprising a source of water.